


The Catalytic Role of Mobile Banking to Improve Financial Inclusion in Developing Countries

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ABSTRACT

Financial inclusion is challenged by numerous factors that include country regulations and policies, poor infrastructure, lack of financial education and literacy, low income levels, political instability, geographical barriers, reluctance by banks to change from traditional banking models of branch networks, and expensive technology. These challenges could be addressed by leveraging technological innovations like mBanking; however, literature indicates that there is limited understanding of integrating mobile technology into banking to enhance financial inclusion. The study collected data from Vhembe District Municipality in South Africa. Results indicated that of the 17 factors tested, 14 were significant for using mBanking to improve financial inclusion. The study recommends that for financial inclusion improvement, developing countries should design realistic policies and strategies that could enable the use of mBanking, especially mobile money and agent banking, that can reach a wider population at low cost.

KEYWORDS

Economic Growth, Financial Digital Services, Financial Inclusion, Mobile Banking

1. INTRODUCTION AND BACKGROUND

Worldwide, countries undertake to attain goals known as macroeconomics, intended to achieve ideal economic stability. This is in addition to the desire to achieve sustainable development goals that, among others, include poverty eradication and balancing inequalities so as to ensure prosperity and inclusive growth for their citizens. Hence, for inclusive growth and social justice, countries must increase opportunities for their citizens to access services regardless of their class, race, gender, religion, and geographical location (El-Zoghbi, 2016). Inclusive growth and social justice can be achieved by improving political, financial, and educational structures, while increasing financial inclusion (Andrianaivo & Kpodar, 2011). Financial inclusion, which is the provision of access to

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financial services and products to individuals, regardless of status or geographical location, has many benefits. Benefits include the attainment of the millennium sustainable development goals such as poverty and hunger eradication, health, and quality education improvement, as well as provision of acceptable employment and economic growth (Allen et al., 2014; Demircuc-Kunt et al., 2015; Dwivedi et al., 2022).

The definition of financial inclusion may vary from one context to another – different countries or regions have differing economic development (Sahgal, 2016). However, despite the varying definitions, the concept of financial inclusion should embrace the pursuit of making financial services accessible at affordable cost to all individuals and businesses (Mehrotra & Yetman, 2015; Dwivedi et al., 2022). Financial inclusion should also infer that individuals and businesses have similar access to the needed and affordable financial products and services. Such may include transactions, savings, payments, credit and insurance; and must be delivered in a responsible and sustainable way (World Bank Group, 2017). Recently, the concept of financial inclusion has become increasingly important. This is largely because financial institutions must expand their infrastructure so as to cover the rural population in a holistic manner, for economic growth (Demircuc-Kunt et al., 2015; Kauda, 2019; Ozili, 2020). Financial inclusion plays a vital role in poverty eradication, reducing inequality, and stimulating job creation. However, to achieve this, banks must first solve their problem of interoperability. Banks must create a mobile payments ecosystem connecting all their customers, regardless of with whom they bank (Mehrotra & Yetman, 2015).

Developing countries, especially those in sub-Saharan Africa, are still unbanked – over 40% of the households and a good number of women and impoverished adults have no formal bank accounts (Demircuc-Kunt et al., 2015). Researchers Demircuc-Kunt et al. (2015) further indicate that banking in many developing countries such as those in sub-Saharan Africa, are still challenged by numerous factors ranging from lack of infrastructure to insufficient financial education. This is in addition to low income levels, financial illiteracy, small size of national markets, political instability, and weak judicial systems. Concomitantly, many banks in those countries are still relying on traditional banking models of branch networks (Allen et al., 2014; Aluko & Ajayi, 2017).

Attainment of a certain degree of financial inclusion is critical for achieving economic growth; however, such requires a more novel approach – that of leveraging technological innovations (World Bank Group, 2017). Financial institutions and governments must utilize the increasing cellular telephone penetration so as to improve contactless and cashless transactions. Such applies especially in areas with limited technological infrastructure and network coverage, and with a low income population (Stijns, Borysko & Marchitto, 2018). This implies that mobile banking (mBanking) is an appropriate approach for financial inclusion. It also signifies that banking is more necessary than banks, in the process of improving financial inclusion.

Mobile and digital technologies such as mobile money have been heralded as improving financial inclusion in many developing countries in sub-Saharan Africa; however, this transition has been successful in some countries whereas stagnant in others (Evans & Pirchio, 2015; Stijns et al., 2018). As mobile phones become more prevalent in developing countries, mobile money has become a major component of digital financial services that can now be accessed by almost two-thirds of the adult population (Ondiege, 2013; Asongu & Kodila-Tedika, 2017). Further still, technological advancement has increased the economies of scale, resulting in lower costs of products and services especially to people with low and irregular incomes. Hence, to achieve these benefits, there is a need to leverage technological innovations in order to enhance financial inclusion. Consequently, there is a need for an appropriate model that could be used to guide the use of mBanking in a contextual manner (Ozili, 2020). However, despite the well-documented evidence of the benefits of mBanking, there is still limited understanding, research work, strategies, and policies intended to leverage such to improve financial inclusion, especially in the rural areas of developing countries. Therefore, this paper sought to develop a model to be used for improving financial inclusion by leveraging mobile technology in the banking sector (mBanking).

The remaining section of this paper is structured as follows: discussion of the banking in developing countries, banking and technology adoption, mBanking concepts, presentation of theoretical perspectives, the conceptual model, the methodology, results, as well as a discussion and conclusion.

2. BANKING IN DEVELOPING COUNTRIES

Developing countries, especially those in the sub-Saharan, have been categorised as having an underdeveloped financial sector. Their financial sector mainly benefits the high- and middle-class income groups in the urban areas, excluding the indigent, women, and unemployed youth in rural settings (Asongu & Odhiambo, 2018; Makina, 2019). Literature indicates that even those in regions like South Africa with a well-developed financial sector, have their economic growth skewed towards urban areas. This leaves the rural settings subjected to poverty, income inequality, and lack of financial inclusion (Chikalipah & Makina, 2019).

In unequal economies, businesses, including banks, prefer to invest in and compete for high-income customers, thus gaining good profit margins. Conversely, providing services to greater numbers of low-income and indigent consumers will attract less profit (Hawthorne & Grzybowksi, 2019). This trend has seen banks in many developing countries choose to open up branches in urban areas of majority high earners, rather than in rural settings with a low-earner population. Such leads to financial inclusion being skewed away from rural communities. Consequently, even new entrants into the market will choose to invest in those areas with a higher proportion of affluent consumers. Leveraging of technology will be left as the appropriate solution to improving financial inclusion in developing countries, especially in the disadvantaged rural areas (Asongu & Kodila-Tedika, 2017; Dwivedi et al., 2021).

According to Chikalipah and Makina (2019), the bank penetration into developing countries such as those in sub-Saharan Africa, has remained low, and has developed at a slow pace. This low banking sector development impacts on financial inclusion. The few available banks will concentrate on opening up branches in urban settings leaving rural communities out of the development plan (Le et al., 2016). Developed banking sectors have notably greater ability to promote economic growth, alleviate poverty, and reduce household and business financing constraints, while increasing competition among firms (Aluko & Ajayi, 2017). Hence, countries with a well-developed banking sector may have a sound financial inclusion. This gives the leveraging of technology such as digitized banking and mobile banking a major role to play in bridging the financial inclusion gap (Dwivedi et al., 2022).

Researchers such as (Andrianaivo & Kpodar, 2011; Ondiege, 2013) indicated that, should the exponential increase in mobile telephony penetration be leveraged in developing countries, accessibility of financial services to the underbanked communities will be increased. Although some countries in sub-Saharan Africa have moved towards using mBanking, the general use of mobile financial services in the region is still in its infancy, making very slow progress (Asongu & Odhiambo, 2018). Additionally, in some developing countries like South Africa, where financial policies are still very strict, the use of mBanking only benefits individuals with no bank accounts if – and only if – they are transacting with those who have bank accounts (Kanobe et al. 2017; Ozili, 2020).

2.1 Banking and Technology Adoption

Demirguc-Kunt et al. (2015) note that digitization of payments as a mode of banking has helped to increase the number of adults with bank accounts. This also includes governments and corporate organizations that have enforced the payments of salaries and/or wages of their employees into bank accounts, leaving employees with no option but to open bank accounts. Consequently, educational institutions and utility services have also enforced the cashless society in which paying tuition fees and utility bills is achieved per mobile phone. This digitization of payments has increased the use of electronic services (e-services) in the financial sector. Such digitization has enhanced responsiveness

in businesses and agility while reducing costs and improving financial inclusion (Siddik et al., 2014; Demircuc-Kunt et al., 2015).

Cavus and Chingoka (2015) indicate that customers' increasing needs and expectations are dramatically forcing banks to innovate. Banks are having to adopt new techniques that can provide services and products to their customers just on time. This desire has resulted in banks and other financial institutions proposing innovative, technology-based ideas such as internet banking, automated teller machines (ATMs), a secure short messaging service (SSMS), the video teller machine (VTM), contactless payments using near-field technology (NFC), SIM Toolkit Application, unstructured supplementary service data (USSD), RFID technology and mBanking, including mobile money directly controlled by telecommunication houses (Ondiege, 2013; Cavus & Chingoka, 2015). These banking innovations are compelling banks to become more customer-centric: most clients are increasingly preferring remote electronic banking to traditional branch banking.

2.2 Mobile Banking

Mobile banking that includes payments, account balances checking, funds transfer and accessing other banking products and services implies the carrying out of banking transactions using mobile devices (Siddik et al., 2014). These transactions are conducted at any time and from anywhere. MBanking therefore creates the opportunity of extending banking hours. It also solves the challenge of geographical barriers, being used in both urban and remote rural settings. MBanking is an example of a mobile commerce application for which financial institutions provide services to their customers via mobile devices. MBanking is a branchless banking service, therefore appropriate for customers in deep rural communities (Oliveira et al. (2014). Hence, with the increasing proliferation of smart devices, mBanking services are seen as a strong tool for improving financial inclusion to the underbanked and unbanked customers (Boonsiritomachai & Pitchayadejanant, 2017).

The International Finance Corporation report of 2018 indicates that using digital financial services has helped many people to enjoy access to formal financial services. Mobile money and agent banking as the choice of mBanking type have been widely used in developing countries due to their affordability, instantaneousness, and reliability in making transactions for customers with no formal bank branches (IFC, 2018). MBanking has been possible via its two modes, namely, the bank-based, and the non-bank-based models. The bank-based model involves clients that have a direct contractual relationship with the bank. Transactions are typically handled by retailers outside the bank branch network; whereas in the non-bank-based model, the retailer is a mobile network operator (MNO) who provides services through technological channels to the customers (Andrianaiivo & Kpodar, 2011). With these two models several innovative banking channels have been made possible. These include branch, mobile, and online banking, that comprises of internet, ATM, and agency banking.

Makina (2019) alludes to the traditional branch banking mainly being based in large urban towns or areas with a dense population, for instance, rural towns. This leaves the widely dispersed customers in rural communities financially excluded. Hence, to improve financial inclusion, banks are obliged to leverage mBanking in reaching the unbanked customers. Evans and Pirchio (2015) indicate that, due to traditional challenges such as technological infrastructure in developing countries, political instability, and high poverty levels, mobile money has found its break-through in some developing countries, but has failed to take root in others. The above-mentioned researchers further pointed out the need to develop a model that can be used by financial institutions and policymakers allowing them to adopt mBanking.

2.3 Theoretical Underpinning of mBanking

To extend the knowledge of mBanking adoption and use, and also to know the theories predominantly being used, this study conducted a content search of databases, search engines, journal and conference articles, using the terms “mobile banking adoption”, “mBanking”, “mobile banking usage” and “m-banking for financial inclusion”. The search was conducted on various databases and search engines

that were expected to have a reasonable number of technology-based publications. These included; Google Scholar, Emerald, IEEE Xplore, ProQuest, and Elsevier Science Direct. This search yielded several factors that were tabulated with their frequencies of appearance in the literature as well as the information systems theories in which they appear. These factors are as illustrated in Figure 1.

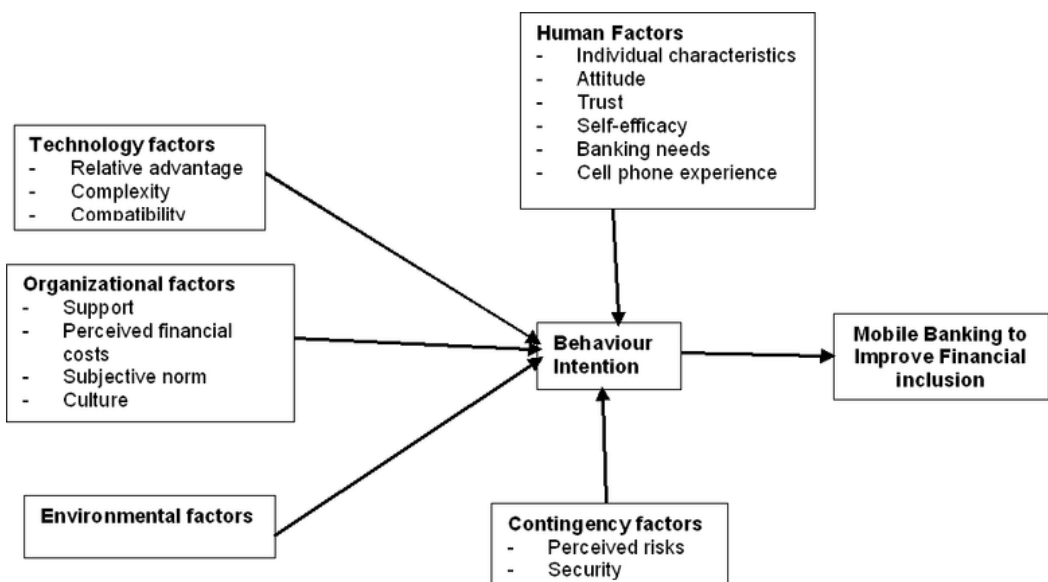
Abbreviations of terms used for factors:

- DOI → Diffusion of innovation theory/innovations diffusion theory (IDT)
- TAM → Technology acceptance model
- TTF → Task technology fit
- SST → Socioemotional selectivity theory
- UTAUT → Unified theory of acceptance and use of technology
- RMM → Response modelling methodology
- TPB → Theory of planned behaviour
- SDM → Strategic decision-making theory
- ISSM → Information systems success model
- BCF → Burton, Cabrera and Frank model
- ELM → Elaboration likelihood model

2.3.1 The Conceptual Model

MBanking is a technological innovation implemented in the financial sector. MBanking leverages wireless tools and devices to provide customers with real-time service based on network protocols. Such protocols include general package radio services (GPRS) and code division multiple access (CDMA) (Demirguc-Kunt et al., 2015). Hence, mBanking as with any other technological innovation, follows logically a sociological lifecycle in which users make a choice to accept and adopt an innovation (Tarhini et al., 2015). Consequently, this requires a change of behaviour on the part of the adopter; it necessitates the conceptual framework/model to examine the behavioural aspects leading to adoption.

Figure 1.
Factors influencing mBanking adoption and use



The conceptual framework or model should also examine the expected benefits of adopting the technology, its cost-effectiveness, as well as the individual or human characteristics.

Oliveira et al. (2014) note that mBanking adoption and use could be explained in the theories of acceptance, adoption, and use of technology, such as the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), the technology acceptance model (TAM) (Davis, 1989), diffusion of innovations (DOI), also known as innovation diffusion theory (IDT) (Rogers, 1995), the task technology fit (TTF) (Goodhue & Thompson, 1995), and the technology, organization and environment (TOE) (De Pietro et al., 1990). Based on this understanding and the findings in Figure 1, a conceptual model was designed, as demonstrated in Figure 2.

2.3.2 Operationalization of the Constructs

As demonstrated in Figure 2, seven constructs were derived to conceptualize the model's independent variables. These were technological, organizational, environmental, human, contingency, and behavioural intention factors. On the other hand, mobile banking usage to improve financial inclusion was derived as the dependent variable. In relation to mBanking and financial inclusion, these constructs could be explained as follows:

- a) **Technological factors:** these include the mobile devices and their characteristics. In relation to this study, the characteristics of these technological devices include those which the users depend on to judge the usability of the devices. Characteristics comprise relative advantage, including the expected benefits; complexity explaining the ease of use of the devices; as well as the compatibility that explains the flexibility of the devices to work with different platforms (Pazarbasioglu & Mora, 2020). Based on the attributes of this construct, three hypotheses were developed.
 - H1a: Relative advantage when mediated by behavioural intention influences the use of mBanking to improve financial inclusion
 - H1b: Complexity when mediated by behavioural intention influences the use of mBanking to improve financial inclusion
 - H1c: Compatibility when mediated by behavioural intention influences the use of mBanking to improve financial inclusion
- b) **Organizational factors:** In relation to this study, these refer to aspects to which the mBanking service providers should pay attention. The institutions should provide for the success of the innovation to be realized. These aspects include support in terms of awareness campaigns, user manuals, and training. Others include the perceived financial costs, subjective norms, and culture (Evans & Pirchio, 2015; Makina, 2019). From this construct, four hypotheses were developed.
 - H2a: Support when mediated by behavioural intention influences the use of mBanking to improve financial inclusion
 - H2b: Perceived financial costs when mediated by behavioural intention influence the use of mBanking to improve financial inclusion
 - H2c: Subjective norms when mediated by behavioural intention influence the use of mBanking to improve financial inclusion
 - H2d: Culture when mediated by behavioural intention influences the use of mBanking to improve financial inclusion
- c) **Environmental factors:** These refer to aspects that may lead financial institutions to implement and adopt new technological innovations. Such aspects may be as a result of external demand and/or desire to achieve competitiveness. Aspects may include external pressure on the banks from competitors, demands from customers, as well as the desire for globalization (Kalema et al., 2014). This construct formed the basis of the third hypothesis.
 - H3: Environmental factors when mediated by behavioural intention influence the use of mBanking to improve financial inclusion

Figure 2.
Conceptual model

Speed	SPE	3	SDM, RMM, TAM
Uncertainty avoidance	UA	3	SDM, UTAUT
Consumer awareness	CA	2	TAM
Image	IMA	2	SDM
Privacy	PRI	2	DOI, SDM
Perceived innovativeness	PEIN	2	SDM, TAM
Perceived enjoyment	ENJ	2	SDM, TAM
Service quality	SQ	2	ELM, ISSM
Ubiquity	UBI	2	SDM
Affordability	AFF	1	SDM
Alertness	ALE	1	UTAUT
Banking needs	BAN	1	DOI
Behavioral introspection	BEI	1	BCF
Benevolence	BEN	1	DOI
Economic factor	ECOF	1	SDM
Expectations	EXPEC	1	SDM
Experience	EXP	1	SDM
Expertise	EXPER	1	BCF
External influence	EXTI	1	SDM
Firm reputation	FREP	1	DOI,
Flow (experience)	FLOW	1	SDM
Frequency of usage	FU	1	SDM
Functional factor	FF	1	SDM
Integrity	INTEG	1	DOI,
Mobile phone efficacy	MPE	1	UTAUT
Organizational factor	OF	1	SDM
Perceived competence	PCOMP	1	DOI,
Perceived elitism	PELIT	1	TAM
Perception of latest banking channels	PLBC	1	SDM
Personal involvement	PINV	1	ELM
Personalization	PERS	1	UTAUT
Reputation	REPU	1	SDM
Service compatibility	SC	1	UTAUT
Services adopted	SADO	1	SDM
Strategic factor	SF	1	SDM
Task characteristics	TCHA	1	UTAUT
Technological factor	TF	1	SDM
Technology anxiety	TA	1	BCF
Technology characteristics	TECHA	1	UTAUT
Technology readiness	TR	1	ELM
Visibility	VIS	1	SDM
Innovation Resistance	IR	1	TAM
Task Technology Fit	TTF	1	TTF

- d) **Human factors:** These factors refer to aspects relating to the people using the technology. These may include their characteristics; also their beliefs about technology, their attitude towards the institutions' culture of introducing innovations, trust in the innovation and those promoting it, self-efficacy towards technology usage, banking needs, as well as cellphone experience. This is

all the more so because mBanking apps may be more suitable for latest phones or smartphone technologies (Talwar et al., 2020). The human factor construct informed the basis of the development of six hypotheses based on attributes.

H4a: Individual characteristics when mediated by behavioural intention influence the use of mBanking to improve financial inclusion

H4b: Attitude of customers when mediated by behavioural intention influences the use of mBanking to improve financial inclusion

H4c: Trust when mediated by behavioural intention influences the use of mBanking to improve financial inclusion

H4d: Self-efficacy when mediated by behavioural intention influences the use of mBanking to improve financial inclusion

H4e: Banking needs when mediated by behavioural intention influence the use of mBanking to improve financial inclusion

H4f: Cellphone experience when mediated by behavioural intention influences the use of mBanking to improve financial inclusion

- e) **Contingency factors:** These refer to those aspects that may arise during the use of the technological innovation, such as perceived risks, as well as the security of customers' funds. These factors are intended to address all those aspects seeking to prevent, govern, and react to security issues, such as vulnerabilities, threats, and a negative impact on the financial institution, as well as on its stakeholders (Boonsiritomachai & Pitchayadejanant, 2017). Based on the attributes of this construct, two hypotheses were developed.

H5a: Perceived risks when mediated by behavioural intention influence the use of mBanking to improve financial inclusion

H5b: Security when mediated by behavioural intention influences the use of mBanking to improve financial inclusion

- f) **Behavioural intention:** In relation to this study, behavioural intention refers to the extent to which a banking customer prefers to use mBanking to other types of banking channels. Such preference may vary from one individual to another; and may depend on numerous factors that enlist an individual's behaviour to stimulate the actual usage of the technological innovation. This construct informed the basis of the development of the sixth hypothesis.

H6: Behavioural intention influences the use of mBanking to improve financial inclusion

3. METHODOLOGY

This study reviewed relevant literature on banking and its influence on economic growth; and how such leads to financial inclusion. Based on the designed conceptual framework, a measuring instrument in the form of a close-ended questionnaire was designed and used to collect data from the Vhembe District Municipality in the South African province of Limpopo. The choice of area of data collection was based on Vhembe District Municipality, as with many rural settings in South Africa and other developing countries, having most of its population with no formal employment and mostly depending on subsistence farming. The district has a population size of about 1,393,949 people, with the majority impoverished, living in sub-standard conditions. Banks and other financial institutions, being interested in wealth accumulation, may have little or no interest in investing in these communities (Statistics South Africa, 2018).

3.1 Data-Collection Methods

Based on the conceptual model, a questionnaire with close-ended questions was designed incorporating a 5-point Likert scale. The numbers 1 and 5 represent strongly disagreeing and agreeing, respectively; 3 indicates neutral, whereas 2 and 4 are respective intermediate values. The constructs of the conceptual

model formed the sections of the questionnaire; whereas their attributes were used to formulate the measuring items.

3.2 Population and Sampling of Respondents

The targeted population of this study was the unbanked customers of the South African Vhembe District Municipality in Limpopo Province with a population size of about 1,393,949. According to Statistics South Africa (2018), most of the population of this area are financially constrained – residents depend on subsistence farming, and have no formal employment. As described by Chikalipah and Makina (2019), banks and other financial institutions have little or no interest in investing in such communities. Sampling the relevant respondents from within this population could therefore follow any acceptable statistical methods for a quantitative study. Hence, the Cochran formula was used to select the sample size used for data collection (Cochran, 1977). The computed sample size of 384 was found necessary for data collection. After determining the sample size, 600 questionnaires were printed and distributed using simple random sampling. The survey strategy was used. Respondents were sampled from those people who had visited busy places such as shopping complexes and malls, as well as communities that were relatively close to one another. Of the 600 distributed questionnaires 411 were returned, with only 398 usable. The usable datasets were transcribed for analysis in the Statistical Package for Social Scientists (SPSS v 25). The collected data was analysed quantitatively using multiple regression analysis.

3.3 Reliability Analysis

Internal consistency was measured by carrying out reliability tests. According to Cronbach (2004), reliability, also known as internal consistency, measures the consistency of the questionnaire items and their relationship to one another. Cronbach (2004) notes that reliability estimates the internal consistency by causally establishing the relationship between the measuring items and the overall consistency. Results of reliability measures are as demonstrated in Figure 3.

As demonstrated in Figure 3, with the exception of culture (Cul), compatibility (Comp), self-efficacy (SE), subjective norm (SubN), and banking needs (BankN), other constructs had reliabilities of 0.7 and above, and directly qualified for further analysis. The constructs of compatibility (Comp), self-efficacy (SE), subjective norm (SubN), and banking needs (BankN) had their reliabilities greater than 0.5; and the number of scale items was less than 5. This implies that these constructs with alpha from .5 to .7 show moderate reliability and could be used for further analysis (Hinton et al., 2014). The length of a scale would seem to influence the value of alpha – the longer the scale the higher the expected alpha values. However, short-scale items would violate tau-equivalence and give a lower reliability coefficient. On the other hand, culture (Cul) had an α -value of 0.488 which is a little less than 0.5; however, it had only three scale items. Briggs and Cheek (1986) allude to constructs with a small number of items having paradoxically spurious values of alpha. Hence, if its mean inter-item correlation for the items is between .2 and .4, such items may be accepted for further analysis. Therefore, the culture (Cul) inter-item correlation was .294, and was accepted for further analysis.

4. RESULTS

This section presents the results of the study obtained after data analysis

4.1 Respondents' Demographics

Frequencies for the participants' demographics and situational variables were analysed, followed by the descriptive statistics of the constructs, and later the correlation and regression analysis (table of results excluded). The frequencies of the demographic variables are as demonstrated in Figures 4 and 5.

As demonstrated in Figure 4 and 5, most respondents, at 61.1% ($n = 243$) were female, and 38.9% ($n = 155$) were male. Of these respondents, 72.4% ($n = 288$) were under 40 years of age and only 8%

Figure 3.
Reliability statistics of the constructs and sub-constructs

Constructs	Cronbach's Alpha (α)	α -Based on Standardized Items	Number of Items
Relative advantage (RA)	.847	.852	4
Complexity (CompX)	.702	.698	3
Compatibility (Comp)	.586	.589	3
Support (Supp)	.804	.813	3
Perceived financial costs (PFcost)	.791	.796	3
Subjective norm (SubN)	.573	.564	3
Culture (Cul)	.488	.491	3
Environment factors (EnvF)	.763	.766	5
Individual characteristics (IndChar)	.748	.767	3
Attitude (Att)	.821	.824	3
Trust (Trust)	.736	.739	3
Self-efficacy (SE)	.683	.695	4
Banking needs (BankN)	.646	.657	3
Cell phone experience (CellExp)	.732	.745	4
Perceived Risks (PR)	.884	.887	3
Security (Sec)	.712	.726	3
Behaviour Intention (BI)	.836	.843	3
Mobile Banking to Improve Financial Inclusion (MBIFI)	.834	.837	3

(n = 32) were above the age of 50 years. The findings of this study imply that if financial institutions support these respondents in the use of mBanking, clients would stand a better chance of becoming familiar with the technological innovation. Previous researchers, such as Venkatesh et al. (2003) and Yu (2012), who investigated moderating factors of technology adoption and usage, established that female users adopt technology more rapidly than do their male counterparts. Furthermore, they indicated that younger users find it easier to use new technology than do older users. This affirms that should mBanking be used to improve financial inclusion, the innovation will be easily adopted.

Another important factor to consider from Figure 4 and 5 is the level of education of the respondents. Results indicated that a good number of respondents – 61.6% (n = 245), had either Grade 12 or an equivalent NQF 4 qualification as their highest level of education. Under the South African education standards, these are people who have completed high school and for whatever reason, one being financial constraints, they have failed to proceed to tertiary institutions. The implication of these findings is that, much as many people, especially the youth in the population of this area, have no formal employment, they have attained basic education (Municipalities of South Africa, 2018).

Figure 4.
Frequencies of the respondents' demographic variables

Factor	Item	Frequency	Percent (%)	Cumulative Percent (%)
Gender	Male	155	38.9	38.9
	Female	243	61.1	100.0
	Total	398	100	
Age group	21 -29 yrs.	138	34.7	34.7
	31 - 39 yrs.	150	37.7	72.4
	41 - 49 yrs.	78	19.6	92.0
	51+years	32	8.0	100.0
	Total	398	100	
Level of education	Grade 12 or Matric (NQF4)	245	61.6	61.6
	Certificate (NQF5)	60	15.1	76.6
	National Diploma/Diploma (NQF6)	67	16.8	93.5
	Bachelor Degree/ Advanced Diploma/ B Tech (NQF7)	10	2.5	96.0
	Honours Degree/Post Graduate Diploma (NQF 8)	14	3.5	99.5
	Master's Degree (NQF 9)	2	.5	100.0
	Total	398	100.0	
Results of demographical and situational variables (N=398)(continue)				
Factor	Item	Frequency	Percent (%)	Cumulative Percent (%)
Mobile operator subscription	Vodacom	200	50.3	50.3
	MTN	174	43.7	94.0
	Telkom	24	6.0	100.0
	Total	398	100.0	
Distance to the nearest financial bank	0 – 5 km	30	7.5	7.5
	6 - 10 km	93	23.4	30.9
	11 – 15 km	182	45.7	76.6
	16 - 20 km	83	20.9	97.5
	21 km and above	10	2.5	100.0
	Total	398	100.0	
Operating bank acc.	Yes	111	27.9	27.9
	No	287	72.1	100.0
	Total	398	100.0	
Registration with mobile banking system	Yes	17	4.3	4.3
	No	381	95.7	100.0
	Total	398	100.0	
If not registered Why?	Not aware	374	98.2	98.2
	Yet to register	7	1.8	100.0
	Total	381	100.0	
Service accessed deposits	Yes	2	.5	.5
	No	396	99.5	100.0
	Total	398	100.0	
Service accessed check balance	Yes	17	4.3	4.3
	No	381	95.7	100.0
	Total	398	100.0	
Service accessed withdraws	No	398	100.0	100.0
Service acc. money transfer	Yes	17	4.3	4.3
	No	381	95.7	100.0
	Total	398	100.0	

Figure 5.
Frequencies of the respondents' demographic variables - continues

Service acc. payments	Yes	17	4.3	4.3
	No	381	95.7	100.0
	Total	398	100.0	
Service acc. Others	No	398	100.0	100.0
Interval of using phone for financial services	Every week	3	.8	.8
	Every month	14	3.5	4.3
	Never	381	95.7	100
	Total	398	100	
Awareness cost charges	Yes	5	1.3	1.3
	No	393	98.7	100.0
	Total	398	100.0	
Cost charges in ZAR	0 – 10 ZAR	2	.5	.5
	11 - 20 ZAR	1	.3	.8
	I do not know	395	99.2	100.0
	Total	398	100.0	
Affordability of cost charges	Affordable	3	.8	.8
	I do not know	395	99.2	100.0
	Total	398	100.0	

In relation to this study, these are people mostly engaged in subsistence farming; while a few are working for wages, but have no formal bank accounts.

The distance from the nearest bank or banking facility is another critical point to consider in this study. Results indicated that the nearest bank, for a good number of respondents at 45.7% (n = 182), was between 11 km and 15 km from their homes. Only 7.5% (n = 30) of respondents indicated that the nearest bank was between 0 km and 5 km away; therefore, leveraging the ubiquitous mobile technology is a welcome idea. This also implies that, were banks to open branches in these communities, this would be at substantial cost to the banks thus increasing their overheads. Hence, leveraging mBanking remains a better alternative way of extending the banks' provision of services and products.

4.2 Regression Analysis

Regression analysis is a statistical methodological approach used for the estimation of relationships between a dependent variable and one or more independent variables (Hinton et al., 2014). In this study the dependent variable was mBanking to improve financial inclusion (MBIFI). Here the P values and coefficients in regression analysis were used to determine whether the relationships in the regression model are statistically significant, identifying the nature of those relationships. In this case a *t-value*, also known as the critical ratio, was used to test for significance at .05 level. Frost (2020) indicates that the contribution of independent constructs to the overall prediction of the model is considered significant if the critical ratio (*t-value*) is greater or equal to ± 1.96 . In this case, values of *t* above 1.96 will give a p-value < 0.05; whereas those below 1.96 will give higher values of p. Results of the regression analysis are as illustrated in Figure 6. The model summary explained the overall prediction of the model 66.1% ($R^2 = .661$). Figure 6 illustrates each independent construct's contribution to the overall prediction of the model. It also presents the tolerance and the variance inflation factor (VIF) which were included to cross check the multicollinearity said to exist if the variance inflation factor (VIF) > 10, although values of VIF less than 5 are preferred.

As shown in Figure 6, apart from the subjective norm (SubN), attitude (Att) and culture (Cul) whose β -values (Beta) were -.045, -.076 and .078, and p-values of .557, .223 and .205 respectively, the rest of the variables made a significant contribution to the overall prediction of mobile banking

Figure 6.
Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	2.046	.453		4.514	.000		
PR	.155	.079	.089	1.967	.051	.474	2.111
Sec	.189	.081	.197	2.350	.012	.369	2.709
CompX	.145	.064	.186	2.263	.017	.475	2.107
RA	.149	.075	.092	1.984	.047	.498	2.008
Comp	.129	.057	.151	2.244	.025	.489	2.044
SE	.167	.080	.148	2.077	.038	.437	2.288
CellExp	.201	.069	.189	2.899	.004	.521	1.920
Supp	.258	.082	.409	3.142	.001	.563	1.776
Cul	.085	.067	.078	1.271	.205	.591	1.692
EnvF	.211	.105	.141	2.005	.045	.396	2.523
SubN	-.049	.084	-.045	-.588	.557	.386	2.593
IndChar	.248	.077	.215	3.228	.009	.523	1.913
Att	-.063	.051	-.076	1.221	.223	.569	1.756
Trust	.183	.076	.140	2.402	.017	.655	1.526
BankN	.207	.086	.126	2.409	.030	.377	2.650
PFCost	.275	.084	.231	3.260	.001	.442	2.264
BI	.218	.056	.426	3.899	.000	.517	1.936

a. Dependent Variable: MBIFI

in improving financial inclusion. Another variable – perceived risks – was on the borderline, with β -values (Beta) of .089, and p-value of 0.051. This implies that its contribution could be interpreted as insignificant. Behavioural intention (BI) and support had the highest contributions of 42.6% and 40.9%, with β -values (Beta) of (.426 and .409), and p-values of .000 and .001, respectively. Others were perceived financial costs (PFCost) with a β -value of .231 and $p = .001$; individual characteristics (IndChar) with β -value of .215 and $p = .009$; security (Sec) with β -value of .197 and $p = .012$; and cellphone experience (CellExp) β -value of .189 and $p = .004$. Banking needs (BankN) and relative advantage (RA) at β -value of .126, $p = .030$, and .092, $p = .047$, had the least respective contributions. Figure 6 indicates that the values of VIF were all less than 5; which confirmed the non-existence of multicollinearity.

4.3 Testing the Hypotheses

The t-test, a parametric statistical technique, was used to test the hypothesis. The t-test was used with the assumption that the population from which the sample had been drawn was normally distributed; hence the homogeneity of the variance and the data collected or random sampling. Results of hypotheses testing are as demonstrated in Figure 7.

Results demonstrated in Figure 7 indicate that, of the 17 suggested hypotheses, 13 were accepted, while four were rejected. Figure 7, indicates that perceived risks (PR) had a t-value of 1.967 which is greater than 1.96 but the hypothesis was rejected. This was due to the fact that its p-value was .51 as demonstrated in Figure 6.

Figure 7.
Hypotheses testing

Hypotheses	t-value	Action
H1a: Relative advantage when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 1.984 > 1.96$	<i>Accepted</i>
H1b: Complexity when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.263 > 1.96$	<i>Accepted</i>
H1c: Compatibility when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.244 > 1.96$	<i>Accepted</i>
H2a: Support when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 3.142 > 1.96$	<i>Accepted</i>
H2b: Perceived financial costs when mediated by behaviour intention influence the use of mBanking to improve financial inclusion	$t = 3.260 > 1.96$	<i>Accepted</i>
H2c: Subjective norm when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = -.588 < 1.96$	<i>Rejected</i>
H2d: Culture when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 1.271 < 1.96$	<i>Rejected</i>
H3: Environmental factors when mediated by behaviour intention influence the use of mBanking to improve financial inclusion	$t = 2.005 > 1.96$	<i>Accepted</i>
H4a: Individual characteristics when mediated by behaviour intention influence the use of mBanking to improve financial inclusion	$t = 3.228 > 1.96$	<i>Accepted</i>
H4b: Attitude of customers when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = -1.221 < 1.96$	<i>Rejected</i>
H4c: Trust when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.402 > 1.96$	<i>Accepted</i>
H4d: Self-efficacy when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.077 > 1.96$	<i>Accepted</i>
H4e: Banking needs when mediated by behaviour intention influence the use of mBanking to improve financial inclusion	$t = 2.409 > 1.96$	<i>Accepted</i>
H4f: Cell phone experience when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.899 > 1.96$	<i>Accepted</i>
H5a: Perceived risks when mediated by behaviour intention influence the use of mBanking to improve financial inclusion	$t = 1.967 > 1.96$	<i>Rejected</i>
H5b: Security when mediated by behaviour intention influences the use of mBanking to improve financial inclusion	$t = 2.350 > 1.96$	<i>Accepted</i>
H6: Behaviour intention influences the use of mBanking to improve financial inclusion	$t = 3.899 > 1.96$	<i>Accepted</i>

5. DISCUSSION AND CONCLUSION

This study was motivated by the fact that, despite the high telephony networks penetration in many developing countries, especially those in sub-Saharan Africa, many people remain financially excluded. South Africa, for example, has a developed banking sector with faster payments system and a dramatic increase in the use of internet banking compared with other countries in the region. However, South African rural communities are still facing financial exclusion. South Africa's mBanking services are nevertheless tagged to bank accounts such as e-wallets, instant money, and wallet-to-bank, with a few cases of agent banking that operate under strict regulations (IFC, 2018; Research & Markets, 2020). However, countries such as Kenya, Rwanda, Uganda, Zimbabwe, Tanzania and some others in West Africa have implemented mBanking in the form of mobile money more directly linked to telecommunication networks than to formal banking sectors (Evans & Pirchio, 2015). Mobile money services are a strong tool for financial inclusion and growing electrification of payments. This implies improving financial inclusion in developing countries such as South Africa. Banks and policymakers must lobby the government to ease the strict financial rules and regulations while nonetheless safeguarding the security and privacy of customers. More studies are therefore needed to highlight issues that could lead to full financial inclusion.

5.1 Discussion of Results

Perceived risks was among the constructs investigated. Results indicated that customers may not perceive mBanking as involving risks if banks endeavour to offer extensive awareness campaigns on their mBanking product and services. However, customers may perceive this as a risk if the awareness campaigns are not clear or properly conducted. The findings of this study do not support those of other researchers such as (Achieng & Ingari, 2015; Kuada, 2019), who found perceived risks as a key antecedent of mBanking adoption. However, they are in agreement with those of Oliveira et al. (2014) who found perceived risks as much of a banking institution concern when considering investing in rural areas that might not be profitable.

Another factor was security that could be a core factor of concern for both customers and the banking institution in relation to mBanking implementation. Such concerns may arise from lack of standardization of the needed technological platform on which to operate mBanking. One must bear in mind that individuals decide which applications or operating systems to install, and which features to personalize on their cellphones. Several freeware applications may have properties that could compromise the security and privacy of mBanking. This is in addition to physical security that may arise from carelessness such as using weak passwords, and/or from theft. Such security breaches arising from various sources may be beyond the control of traditional security settings, ultimately overwhelming mBanking. In this study, the outcome of this factor aligns with the findings of researchers (Siddik et al., 2014; Cavus & Chingoka, 2015; Hong, 2019) who also found security a key factor in mBanking.

Complexity was also found to be significantly influencing mBanking use in enhancing financial inclusion. When customers perceive mBanking as less complex, they will develop a belief in its potential, also known as self-efficacy of using the technology. Both complexity and self-efficacy were found to make significant contributions. Furthermore, such positive beliefs make customers realize the benefits of mBanking. This is also known as relative advantage. These three constructs – complexity, self-efficacy, and relative advantage – have been found by other researchers of significant importance to the adoption and use of technology (Rogers, 1995; Oliveira et al., 2014; Tarhini et al., 2015; Achieng & Ingari, 2015; Hong, 2019). Both complexity and self-efficacy of mBanking have one common influencing factor – cellphone experience – since this increases self-efficacy on one hand while reducing complexity on the other. Therefore a customer who is used to navigate the various mobile applications will find it easier to use the mobile banking app. Findings of this study support those of Oliveira et al. (2014) who also found cellphone experience a good antecedent to mBanking adoption and usage.

Compatibility was found to be significant in the use of mBanking to improve financial inclusion. This implies that, if mBanking is compatible with the various hardware and software of mobile phones, it will be easier to use. These findings are in agreement with those of other researchers such as Rogers (1995) and Tarhini et al. (2015), who indicated that compatible systems with the ability to accept input from their newer version are easily accepted, adopted, and used. In the same way customers believe that if mBanking usage meets support from the financial institutions in the form of facilitation, demonstration, sensitization, or training on its use, such will boost usage. Support has been widely found to be significant by several researchers into technology usage. Support is considered a key factor in any technological innovation adoption (Kalema et al., 2014; Tarhini et al., 2015; Aluko & Ajayi, 2017; Asongu & Odhiambo, 2018).

Culture was found to have no significant contribution to the use of mBanking in improving financial inclusion. Cultural values such as individualism, or uncertainty avoidance, and short-term orientation, could influence technological innovation adoption if such an innovation is new to the users (Allen et al., 2014; Le et al., 2016). It must be taken into consideration that using mBanking is similar to using any other mobile application. As most participants already subscribe to a telephone network, mBanking will be a new product, but not a new technology; and culture will have little or no influence on it. The implication of these findings is that technological innovation adoption may vary depending on societal receptiveness that might be influenced among others by culture, religious beliefs, and social influence. However, bearing in mind that mobile technology is not new, having overcome many challenges in its inception, this will have made a soft landing for mBanking. Likewise, subjective norms that explain individual perceptions and beliefs that people who are important to them expect them to use mBanking was not found significant in this study. These findings do not support those of Fishbein and Ajzen (1975). These researchers maintain that subjective norms have a positive significant relationship with the intention to adopt technology. They were in agreement with Kelly and Palaniappan (2019), who observed that banking customers will adopt any new technological innovations based on expected benefits and satisfaction, rather than on social influence.

Many profit-making organizations will adopt technological innovations because of external demand, or simply to achieve an edge over their competitors in the business environment; this is also known as environmental factors. Results of this study indicated that external environment plays a significant role in the use of mBanking in improving financial inclusion. These findings support those of previous researchers such as (Oliveira et al., 2014; Kalema et al., 2014; Tarhini et al., 2015), who also indicated that environmental factors such as external pressure on the banks from competitors, customers' demands, globalization, other banks' support, and readiness, may compel banks to provide new services and products such as mBanking.

Individual characteristics were also found significant influencing factors. Individual characteristics move hand in hand with complexity, relative advantage, self-efficacy, and attitude. This implies that, if the latter factors are significant, so also, individual characteristics will be found significant. This explains why the attitude variable was additionally found significant in the use of mBanking to improve financial inclusion. It could be added that a positive attitude towards a technological innovation such as mBanking is more inclined towards the relative advantage or expected benefit from the technology. Venkatesh et al. (2003); Kelly and Palaniappan (2019) indicated that individuals' attitudes towards technology are influenced by their perceived benefit, perceived usefulness, and perceived credibility or trust. As with any other online or wireless transaction, mBanking can be successfully implemented if customers' knowledge and concerns are well understood. Therefore if customers' privacy and security concerns relating to mobile payments and other mobile-based services and products are well understood, clearly explained, and taken care of, they will trust the system. Such makes trust a significant factor in mBanking usage in improving financial inclusion. The findings of this study support those of several other researchers such as (Xin et al., 2013; Oliveira et al., 2014; Talwar et al., 2020), who also indicated that, for any monetary transaction, people must be able to trust one another.

Banking needs was found to be significant in the use of mBanking in improving financial inclusion. This implies that the increasing globalization, the desire to have a wider market share, the enhancement

of the information society, as well as technology advancement are increasingly making individuals as well as organizations open bank accounts. The proviso is that such accounts must operate safely and reliably in handling cash when conducting transactions nationally and globally. The findings of this study support those of (Oliveira et al., 2014; Talwar et al., 2020), who commented that, with the evolving technology, banking customers require services that can satisfy their needs. Failure by banks to do so may cause them to lose their customers' loyalty. Banking needs could arise among others as a result of positive responsiveness of the system. Customers may be provided with real-time answers to their queries as well as to their perceived financial costs. Cost-effectiveness must be treated similarly, with expected benefits that outweigh the costs. Based on the findings of Statistics South Africa (2018) and Hawthorne and Grzybowksi (2019), the population of this study had a majority of people living below the poverty line, implying that to them the cost of a new banking service and/or product is a significant factor and has a greater influence on its adoption and usage. This study's findings support those of (Achieng & Ingari, 2015; Asongu & Odhiambo, 2018), who remarked that direct and indirect costs involved in mBanking may either attract or deter customers from adopting the service.

After banking customers grow satisfied with the use of mBanking, they develop the intention to continually use it, and also to refer others to the service. This behavioural intention to use technology has been found in various research studies as a major antecedent to actual usage; and so was found significant in this study. The findings of this study support those of Hong (2019), who comments that, whereas mBanking is motivated by social and personal factors, behavioural intention speeds up the influence of these factors, thereby improving actual usage.

5.2 Conclusion

Developing countries have seen dramatic growth and improvement in usage of mobile telephony, yet with lower banking services development. Since mobile telephony has no geographic boundaries, and can be used at reduced transaction cost, it is a good tool for improving financial inclusion in the geographically disadvantaged areas (Dwivedi et al., 2022). In that developing countries' largest population resides in rural areas with limited or no commercial banking services, leveraging mBanking is of paramount importance for financial inclusion. Furthermore, mobile telephony has had an exponential penetration in many developing countries. Access to financial services and products will increase the reach to a wider population that is yet financially excluded. The findings of the study indicated that a good number of factors influencing technology adoption in general also influence the use of mBanking in improving financial inclusion.

Financial inclusion is essential for economic growth; therefore, its contribution to a country's economy could be enormous if all regulatory challenges associated with its attainment are addressed (Dwivedi et al., 2021). Attainment of financial inclusion in using technological and financial innovations is a step forward in achieving sustainable economic development for the developing countries. However, there are a number of factors such as government regulations, globalization, liberalization, privatization, tax policies, as well as integration with the international financial market, which countries must address for financial success.

This study's findings revealed that mobile phone penetration can be leveraged to improve financial inclusion at low cost. It can also provide cost-effective financial services and products affordable to indigent or low-income people in the less advantaged rural communities. Findings also indicate that, to enhance financial inclusion, governments must put in place favourable policies and regulations that allow non-banking institutions to participate in the provision of financial services such as mobile money. There is also a need to improve household income rates, reduce illiteracy and build better ICT infrastructure, by introducing favourable policy reforms while boosting or subsidizing investments in the ICT sector. It is imperative for governments to encourage and support partnerships between financial institutions such as banks and other non-banking financial institutions, microfinance institutions, as well as mobile money service providers such as telecommunications networks. Lastly, it is evident that, with the increasing ubiquity of cellphones within the unbanked and underbanked

communities in developing countries, such leveraging will help to provide financial services to the wider financially excluded population (Dwivedi et al., 2022).

5.3 Limitations and Recommendations

Researchers such as Venkatesh et al. (2003) and Kalema (2014) recommend the analysis of moderating effects of demographic variables in quantitative studies investigating the adoption and use of technology. However, this study only analysed respondents' demographics and situation variables using descriptive statistics. The study did not investigate their interacting effects. Kalema (2014) noted that users' perceptions change with time; hence, it is essential that their demographics or situation variables are analysed to determine their interacting effects on the adoption and use of technology. Therefore, this study recommends that future studies examine the interacting or moderating effects of the users' demographics and situational variables. This is because individual experiences may change with continued usage of the technology; and such may influence their perception and attitude towards the technology.

In addition, data for this study was collected at only one time. However, because continued usage may change users' perceptions and attitudes, this study recommends that future research consider using a longitudinal survey for data collection in studies related to adoption and use. A longitudinal study will provide greater insight into how users perceive the technology over time. It will also help to conduct a more comprehensive comparison of the causality and the interrelationships between variables and their findings and this study's framework.

The primary data for this study was collected within the Vhembe District Municipality of South Africa. Much as this population was well sampled to represent less advantaged communities, caution should be taken when generalizing it to the sub-Saharan or developing countries. This study therefore recommends that future researchers endeavour to collect data from various regional countries to enable a more systematic comparison and generalization of the findings. Such comparisons will assist policymakers to arrive at a better analysis. Policymakers can also devise strategies which will ignite mobile banking in all developing countries in the same vein as mobile money. This study was conducted in only one rural South African district municipality. Although a relatively large sample size was used, in this country, different provinces have different challenges and different decentralised administration. The findings of this study may therefore be limited when it comes to the generalization to all South African rural settings. This study recommends that future research expand on the scope, including more provinces that serve the rural population. In so doing, the findings and their developed frameworks could be extensively applied to the national level, and be more widely generalized.

5.4 Contribution of the Study

The developed contextualised framework ensured that all factors influencing the leveraging of technological innovations such as mBanking for improving financial inclusion were incorporated. The development process included statistically tested methods to identify factors that either should or should not be added to the final framework. The developed framework, by following rigorous scientific processes, can comfortably be used by researchers, banks, and other financial institutions, in informing the adoption and use of mobile banking which will improve financial inclusion. In so doing, this study will be making a significant contribution to theory and practice, as well as to management.

This study indicated that management should be mindful of the relationship between financial inclusion and financial innovations, financial stability, financial literacy, poverty levels, state of the economy, and regulatory systems. This study measured these parameters in relation to its aim. The study further followed a textual analysis to identify the factors that were later tested quantitatively. The step-by-step approach followed in identifying factors formulating the conceptual framework is a good methodological contribution. Future researchers are encouraged to follow it in conducting similar research in order to arrive at conclusive results.

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